Some General Comments About Dark Energy

* Dark Energy Research *is* astronomy:
  - If you use the universe as a laboratory – you need to understand your apparatus.
  - Stars and galaxies are messy. There are no truly "clean experiments" in this field.
  - Past experience with astronomical research has shown that it is often best not to think too hard in advance – just go measure stuff, and give the data to everyone. Clever ideas can come from anywhere.

* Dark Energy Research *is not* astronomy:
  - We are aiming for precision well beyond what has previously been achieved.
  - We need to treat this like an experiment with an explicit quantitative goal. We should start with that goal and then do the requirements flowdown on the apparatus and the analysis in a controlled way.
  - The analysis is complex and systematics limited. Very large data sets imply that we need to plan our analyses early and develop a computing model as part of the initial experiment design.
  - This requires an organized collaboration, not a collection of free agent observers.

* The dichotomy between these two points of view has created much of the tension in this field. But both are correct. We need to accept that conclusion and plan future programs accordingly.

The Selection of LSST and WFIRST Was Due to their *Broad* Science Cases

* Contents:
  - Introduction
  - LSST System Design
  - System Performance
  - Education and Public Outreach
  - The Solar System
  - Stellar Populations
  - Milky Way and Local Volume Structure
  - The Transient and Variable Universe
  - Galaxies
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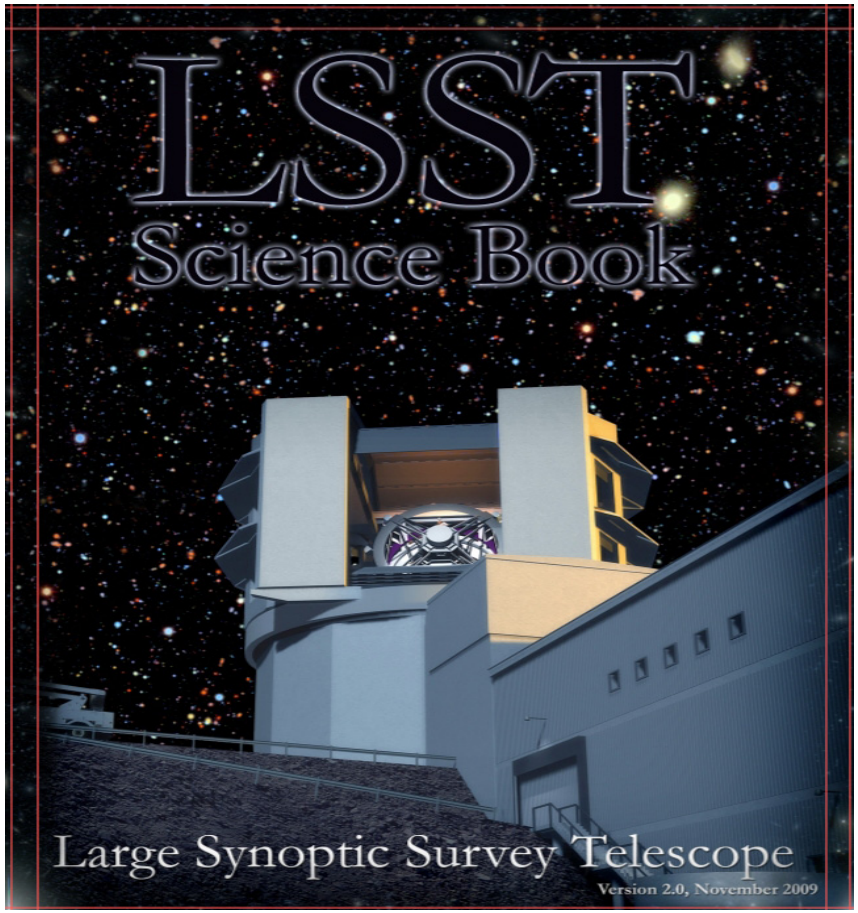
  - Supernovae
  - Strong Lenses
  - Large-Scale Structure
  - Weak Lensing
  - Cosmological Physics

Dark Energy



Future > $1B experiments for “dark energy alone” are probably not in the cards.

What if $w = -1.0000 +/- 0.000$?

* I don't see this as such a dismal situation!
  - We don't pat ourselves on the back enough when predictions continue to be verified at increasingly higher precision.
  - It is amazing that the standard model of particle physics works as well as it does.
  - It is even more amazing that the standard cosmological model works as well as it does.
  - That's great, even if we never understand DE and DM.

* The analogy to early atomic spectroscopy is appropriate here.
  - Yes, the Schrodinger Equn (with relativistic corrections) explained the spectrum of hydrogen, but it still made sense to continue to make higher resolution and broader wavelength measurements of more complex atoms and molecules.
  - None of that helped us to better understand the collapse of the wavefunction! Sometimes you just live with things you don't understand.

* The growth of structure in the expanding universe is a rich and beautiful story.
  - It is not that difficult to lobby for experiments that probe this story with increasing capability.
  - This may just be sloganeering. Beyond LSST and WFIRST, I wouldn't talk about testing ΛCDM (assuming they measure $w = -1$). I would talk about "mapping everything in the universe". We may find new clues in unexpected ways.